Performance Enhancement of Next Generation Networks

Introduction

IoT describes the network of physical object “things” that are embedded with sensors, software and other technologies for the purpose of connecting and exchanging data with other devices and system over the internet. Nowadays we are taking use of IoT in every sector like Agriculture, Energy, Finance, Healthcare, manufacturing, Transportation.etc, Tracing and location based services using IoT are considered along with the relay concept and integration of AI in next generation networks.

A relay network is a sort of network that is used to transport data between two devices that are too far apart to communicate directly, such as a server and a computer. As a result, the network must transfer or "relay" the data to other devices known as nodes, which then pass the data on to its intended destination. The Internet is a well-known example of a relay network. By transmitting and receiving data over a chain of linked nodes, a user may see a web page from a server halfway around the world.

Artificial intelligence mimics the problem-solving and decision-making abilities of the human intellect using computers and technology. Making intelligent machines, especially skilled computer programmers, is both an art and a science. While using computers to investigate human intellect presents a similar challenge, AI need not be constrained to physiologically detectable behaviors.

Literature Review:

The location monitoring, location-based services, and IoT applications are the main topics of this study endeavor. In [1]. This article proposes a mobile application architecture on the Internet of Things (IoT) for public bus service, allowing passengers to follow a bus's precise location and learn when the next bus will arrive at a specific stop. Additionally, this programmed would let consumers buy tickets online using a mobile banking app or an online wallet, which will shorten the lines for buying actual tickets. Additionally, customers will be able to choose an available seat using the suggested programmed.

[2], In this article, provide a framework for location tracking that consists of a tracking device, a backend server, and mobile application. The tracking device's GPS receiver allows it to produce location information in real time. This device's TCP/IP stack integration allows it to access the Internet and upload location information. The device lacks a keyboard or other input devices. due to concerns about portability and power. Server and app control of the device is reliant. In order to gather information and verify control commands, a server side system is put into place. We also create a smart phone app that can be used to retrieve data, show location on a map, and remotely operate a device. Our tracking system is specifically integrated with a walking stick. This walking stick is a useful item for the elderly. With the help of our app, their loved ones can find them and keep tabs on where they are. Once the connection is broken, the server is unable to communicate with the device at all. The solution to this issue is to use the heartbeat technique to maintain the connection once a TCP connection has been made between the device and the server.

[3], Now here taking in to account tracking moving object detection by help of virtual items that are directly related to the moving object's current position can be found and allocated for web-based IoT services. The next position of the objects must be predicted by using a machine learning method before allocating suitable virtual objects. In future work to improve the VO composition and show a prototype in a real-world setting.

In [4], talking about the vehicle tracking, monitoring, and warning system challenge . Radio frequency identification (RFID) technology is used to track and monitor student, and bus, In this fire sensor is also employed to look for fire mishaps. Through GSM, the speed of the bus can be calculated and a message sent to the parents. The bus unit, parent unit, and college unit are the three main units that make up the system. The bus unit is used to monitor when a student boarded or deboarded the vehicle using an RFID card. The parent unit and college unit that are aware of the student's presence are given this information. The college bus is tracked by the IOT, and the system also receives a warning if the bus exceeds the speed limit. This technology can be expanded to provide continuous student monitoring, which will benefit parents and other legal representatives.

[5], In this developed a novel technique for locating public buses using BLE proximity beacons in order to predict when they will arrive. Without using GPS, By installing an Estimate location beacon on the bus, Bluetooth Low Energy (BLE) proximity beacons can be used to follow a bus's travels. Once the bus has been located, a cloud server is consulted to determine the bus ETAs. Additionally, a smart phone application called myBusz has been created so that passengers may view the bus's ETA in real time. The end goal of this research is to develop a precise bus location tracking and ETA system that is independent of the availability of real-time GPS data.

[6],In this author explore use of Internet of Things (IoT) and Long Range Radio (LoRa) in marine environments. the LoRa technology's maximum range and a probable location determination utilising the passive RSSI analysis. We tested the range and position of the sea vessel over the course of 3 days by deploying 5 coastal-based nodes (2 of which failed) and 2 sea vessel nodes on the same vessel. give an overview of our findings, including the maximum range attained when sensing data from the water , distance estimation based on RSSI error utilizing various data sources , location computation and obliteration errors , and environmental telemetry.

In [7], the author said about wireless sensor networks because of mobile node tracking system proposed IoT WSN application. In this the position of the mobile node can be determined using the received signal strength (RSSI) data. In this work, four fixed nodes and one mobile node are installed in the network. The tracking is carried out based on the Received Signal Strength values collected from the anchor node. The mobile node is tracked based on its

coordinates in 2D space and the position is determined using the trilateration approach. The idea is to communicate data from the nodes to the cloud via a GUI application. the goal is to gain a general understanding of tracking systems for both indoor and outdoor scenarios.

[8], gives the Experimental information of using IoT such as blue tooth based location aware facilities, a low-cost, scalable solution with centralized coordination is produced through an edge-focused Internet of Things (IoT) architecture.

By using IoT we can referred so many way of tracking location in that [9] is explores that , Parents will receive a message and vibration from the Android app notifying them that the user has left the Safety Zone and has switched to Real Time mode. The Android application's data presentation mechanism will show the device's location information, heart rate and time from a single integrated data source from Firebase.

In [10], an architecture with guaranteed and differentiated QoS support for mobile video surveillance applications The design is dependent on the evolving packet core of 3GPP 4G.(EPC). The machine-to-machine gateway, media server, QoS enabler, and surveillance application are the key elements. The performance measurement analysis of a proof of concept prototype shows that the delays brought on by employing the suggested architecture are tolerable from the perspective of the end user.

In [11], authors focus on the concept of Quality of Service (QoS) provisioning for relay transmission by considering packet delivery time over multi hop links in relay enhanced LTE-Advanced system. Under the framework of utility theory, authors analyze quality-of-service satisfaction and its fairness for the base station and relay-node-connected users. Simulation results show that proposed optimization enhances overall QoS satisfaction of relay enhanced network.

Authors in [12] propose a method to find the sub optimal location to deploy relay station achieving load balancing and throughput enhancement of the wireless network. Further, the proposed scheme consisting of two stages identifies position by considering the distance and angle of the relay stations there by reducing the computational complexity as compare to global optimization or learning based approach. Using simulation studies the proposed scheme is found better compare to existing scheme.

In [13], authors propose the Non Orthogonal Multiple Access (NOMA) based wireless network using Physical Layer Network Coding (PLNC) scheme with three time slots and half-duplex decode-and-forward (DF) relay. Closed form expressions for the end-to-end outage probability of the proposed NOMA-PLNC relay network is derived and validate the numerical results of the proposed relay network using simulated experimental results.

The authors in [14], introduce a False Data Injection (FDI) attack detection before decoding in DF cooperative relay network. Authors propose a physical layer detect-before-decode (DbD) method. by implementing a Unified Error Sufficient Statistic (UESS) containing the full information of FDI attacks is constructed. Since proposed UESS is applicable to all link conditions, the source to destination outage probability of the DF shows the better probability.

Authors in [15] investigate a joint beam forming and time switching design for an energy constrained cognitive two way relay network. By considering semi definite relaxation and successive convex optimization methods, authors determine the beam forming matrix and TS ratio. Also a closed form expression of the optimal solutions of each sub problem that facilitates the design of sub optimal iterative algorithm is derived to handle the original sum rate maximization problem. The effectiveness and superior performance of the proposed joint design compared to conventional schemes is illustrated by simulation results.

Artificial intelligence (AI)-based unmanned aerial vehicle (UAV) assisted wireless networks (UAWN) are tackling the challenges posed by random fluctuations in wireless channels, blocking, and user mobility consequences. , . For dynamic situations, AI-supported Network-slicing based Next-generation Wireless Networks are proposed, together with unmanned aerial vehicle (UAV) assisted next-generation networking. QoS-Oriented Network Association for Next-Generation Mobile Networks with Artificial Intelligence. AI-enabled Multi-Agent Systems can be employed to take advantage of device-level negotiation, decision-making, and distributed learning capabilities, as well as real-time smart contracts between cars and tolls using Block chain. Analysis of the Positioning of Two Monopole Antennas for AIS Signal Reception on Satellite. The Low Power Wide Area Network Platform's Next Generation Architecture. The following uses of AI include

The authors of paper [16] build a jitter graph-based network model and a Poisson process-based traffic model in the context of 5G mobile networks. Further, the authors use a low computational complexity greedy approach to tackle the problem of QoS routing with resource allocation based on queuing theory. Finally, in order to discover an ideal path from the source to the destination, a QoS-oriented adaptive routing strategy based on Deep Reinforcement Learning (DRL) SPACE, which is a DRL architecture with parameterized action space, was devised. The authors use a numerical packet-level simulation to model an M/M/C/N queuing system to test the viability of the greedy QoS routing approach with resource allocation. Simulation results show that in proposed routing system enhance traffic's QoS metrics including packet loss ratio and queuing latency.

In [17], RFID systems can be used to identify, locate, and track things, making daily operations easier for operators. In the proposed work, a new open-source RFID simulator is introduced, allowing for environment modeling and a priori testing of RFID tag and antenna placement. By testing the effectiveness of the localization or tracking algorithms in simulation, any potential flaws could be addressed before the facilities are used in the field. The constructed scenario can have any number of tags and antennas, and the simulator delivers the phase and RSSI signals for each tag. Each reader antenna has been parameterized to allow for the replication of antennas from various vendors. To reach a large audience, the simulator is designed as a plugin of Gazebo, a popular robotic framework connected with the Robot

Operating System (ROS). In order to evaluate the simulator, a warehouse scenario is created. A tag localization approach is then utilized to estimate the position of the deployed tags in the scenario using the phase unwrapping technique and hyperbolae intersection method while using a reader antenna installed on a mobile robot. The experiments' findings revealed accurate outcomes.

Domain of mobility.[18] This study shows how AI-enabled Multi-Agent Systems may be used to leverage negotiations, decision-making and distributed learning capabilities at the device level, as well as real-time smart contracts between cars and tolls utilizing Block chain. This solution also demonstrates how real-time data from numerous IoT devices found in automobiles and infrastructure can be monetized. While blockchain protects members' anonymity, it also serves as an economic transactional layer and a governance layer between the network's devices. Blockchain, IoT, Machine Economy, Real-time Smart Contracts, Multi-Agent Systems, and Collaborative AI are some of the index terms.

In[19], GPS advancements allow for reasonably accurate user location monitoring in outdoor settings. There is a limit to be applied in a complicated indoor setting though because of signal loss. In order to track the user's location in inside contexts, communication technologies including WiFi, Bluetooth, and Ultra-Wide Band are used (UWB). However, there is a limitation because of various barriers and walls in the inside setting. only be used to track the user's precise location. As a result, adopting a combination of numerous algorithms rather than just one can increase location accuracy when using location monitoring technologies. This study combines the weighted fuzzy matching algorithm, the PSO algorithm, and the fingerprinting technique. The proposed method can produce higher location precision, according to simulation.

Authors in [20], In a scenario where robots are constrained to remain in their confined region, two coordination methods have been developed for target tracking by using numerous mobile sensors. For our situation, the target tracking difficulty is created. Algorithm-1, which was installed on each robot, performed better in terms of communication cost (which is directly related to the number of times the target passes a robot's bounded region), but it experienced lesser accuracy due to its poorer degree of detection.

Although the overall mobility of each robot and the cost of communication are considerable,

Algorithm-2 demonstrated higher levels of detection and tracking accuracy. As a result, Algorithm-2 is not appropriate for robots whose mobility is limited by battery life. Future versions of these algorithms must By including some machine learning, Algorithm-2 can be enhanced or soft computing techniques.

Problem statement

The performance of the network and the use of IoT applications are the foundations for tracking location-based services. Now taking into account the issue of fog detection and object and cracked tracking AI with the aid of IoT and network performance. utilizing mobile apps and machine learning algorithms as a method. The main role involves finding objects and cracks, detecting fog, and giving back information about what is on the track at real time.

Significance of the Study

A location-based service (LBS) is a type of software service for mobile device apps that needs to know the precise position of the mobile device. By utilizing one or more location-tracking technologies, the application gathers geodata, which is information that is obtained in real-time.

Objectives of the study

- The objectives of the study is IoT frame work to obtain object detection,
- Fog detection with help of mobile app, and global positioning of the system and here also taking into consider that RF identification,
- Sensors by using the simulation method.

METHODOLOGY

AI using machine learning algorithms, python software. simulation for identifying object, fog , track crack detection. Without any complications

- Studied the different type of paper related to next generation networks using different technology such as
- Relay related literature papers
- IoT performance in networks generation
- AI performance in next generation networks review papers
- And study the different methods applied in the next generation networks performance

- Attended classes and referred notes for course work study
- Studied the papers for the review of literature on domain of interest and presented the seminar

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